I. Objectives

1. Calculate a species' biodiversity index.
2. Identify arthropods using a dichotomous key.

II. Introduction

Scientists like to classify things – that is, to put objects with similar characteristics in groups and to identify relationships between different individuals. The theory of evolution works well under this type of analysis. We hypothesize the orderly development and diversification of all organisms from an ancient, simple, single cell. To help novices, experts have developed classification charts and schemes that enable us to recognize key differentiable characteristics and trace or "key out" a species' identification. We will utilize this this method for the anthropoid family.

Scientists use a biodiversity index to quantify, in terms of an observational number, the biodiversity of an area. It is not a perfect measure but it is fairly easy to implement. The first step is to conduct an inventory of the area, keeping track of the total number of individuals as well as the number of species observed. The biodiversity index is just the total number of species observed divided by the number of individuals observed. Of course, expert observers are more likely to discern both more individuals and more species and observed diversity may vary diurnally and seasonally so results can vary.

III. Materials

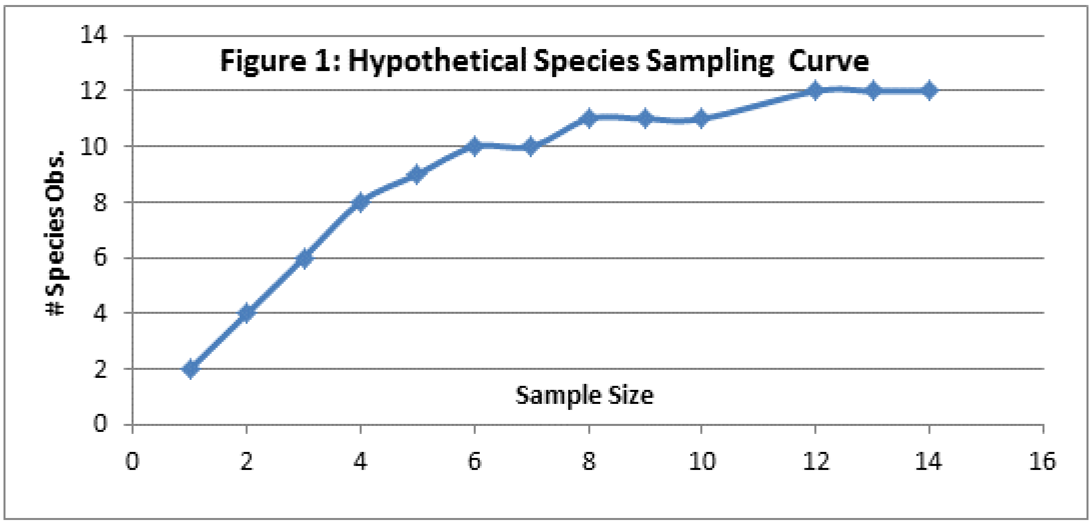
Southwestern tree guide, clipboards**,** arthropod key and worksheet

IV. Theory and Calculations

Imagine heading out to a field location, say a riparian woodland, with the intent to study the species diversity of anything you might find there – trees, grasses, lizards, ants, bees, macroinvertebrates, or beavers. You may be standing on an ant pile with hundreds of ants around, but they will probably all be of the same species. High count, low diversity. You might wander over to the stream bank and observe 10 different birds, each one a unique species over a 15 minute window. Low count, high diversity. In any one location, you might find only a fraction of total number of species that an exhaustive survey by an expert might reveal. So clearly, the proper way to sample our natural environment has to consider many factors and can only be a rough approximation to the true value.

Because the natural environment is so vast, we almost always rely on some approximate method of "sampling" the environment. One popular approach is make observations along a transect at regular or random locations and use this to estimate the real world. Imagine a riparian woodland again. If the transect is too short, you might miss all the trees! If the transect is too long, it might extend out of the riparian woodland into a different ecosystem. So in general, scientists consider many factors and try to select a transect length that is neither too short or too long.

Finally, assuming you are staying inside the same characteristic area, as your sample size increases, you should expect that the chances of observing every species in that area to increase and you would expect a plot of number of species vs. sample size or transect length to asymptotically approach this maximum number (Figure 1).



Again, here is the formula we will use to estimate the biodiversity index:

biodiversity index = no. different species observed / no. of individuals observed

V. Prelab Definitions

1. antenna

2. appendage

3. dichotomous key

4. biodiversity

5. transect

6. sampling

VI. Lab Procedure

<u>Part A. Dichotomous Key Use</u>

1. Use the chart and worksheet provided to systematically identify each organism.

<u>Part B. Biodiversity Index</u>

1. Work in groups of two
2. Spend 15 minutes walking around the main campus buildings or parking lot. Count the number of trees and number of tree species.
3. Use or draw a campus map to keep track of results from different areas.
4. Collect one leaf from each different tree species and bring them back to class.
5. Compile your data and calculate the biodiversity index for campus trees

VII. Lab Discussion

1. How do our index values compare with the index of trees within a mile of campus?

2. Why would you expect/not expect that the diversity index of different species in a particular environment to be similar (comparing trees with ants, for example)

3. How variable were the results from the different class groups? What does this suggest about this procedure?

Lab courtesy of Dr. Jim Washburne